

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)

**The Global Venture of AT&T Corp. and
British Telecommunications plc**)

Applications of AT&T Corporation, VLT Co. LLC,
Violet License Co. LLC and TNV [Bahamas] Limited
for Grant of Section 214 Authority, Modifications of
Authorizations, and Consent to the Assignment of
Licenses)

IB Docket No. 92-212

AFFIDAVIT OF JANUSZ A. ORDOVER AND ROBERT D. WILLIG

I. QUALIFICATIONS

A. Professor Ordover

1. My name is Janusz A. Ordover. I am Professor of Economics at New York University, which I joined in 1973. At New York University, I teach undergraduate and doctoral level courses in industrial organization economics, which is the field of economics concerned with competition among business firms and upon which "antitrust economics" is founded. I have devoted most of my professional life to the study and teaching of industrial organization economics and to its application through antitrust law and policy.

2. In July, 1991, I was appointed by President George Bush to the position of the Deputy Assistant Attorney General for Economics in the Antitrust Division of the United States Department of Justice. In this post, I participated in the drafting of the 1992 Horizontal Merger Guidelines, which have been widely used by courts and antitrust enforcement agencies. I returned to New York University in 1993.

3. I have written extensively on a wide range of antitrust and telecommunications topics, such as mergers and joint ventures, predatory conduct and entry barriers. My antitrust articles have appeared in the *Yale Law Journal*, the *Harvard Law Review*, the *Columbia Law Review*, and many other journals, monographs and books, here and abroad. A full list of my articles and other professional publications and activities is presented in my *curriculum vitae*, which is attached as Exhibit 1.

4. I have lectured extensively on antitrust topics to the American Bar Association, the International Bar Association, and the Federal Trade Commission (FTC). I recently delivered lectures to the FTC during its hearings on the Future of Antitrust Enforcement, which were organized by FTC Chairman Robert Pitofsky. I have also lectured on antitrust policy at colleges and universities in the United States and abroad, and at many conferences and meetings sponsored by various legal organizations.

5. I have acted as a consultant on antitrust and other competition matters to the Department of Justice, the FTC, and the post-communist governments of Poland, Russia, and Hungary. I have also consulted for the World Bank and the Organization for Economic

Cooperation and Development in Paris. I have acted as a consultant in numerous antitrust litigations and investigations, including market definition and anti-competitive conduct matters for the FTC, Department of Justice and private clients in the United States, Australia, Germany and the European Union.

B. Professor Willig

6. My name is Robert D. Willig. I am Professor of Economics and Public Affairs at the Woodrow Wilson School and the Economics Department of Princeton University, a position I have held since 1978. Before that, I was Supervisor in the Economics Research Department of Bell Laboratories. My teaching and research have specialized in the fields of industrial organization, government-business relations and welfare theory.

7. I served as Assistant Deputy Attorney General of Economics in the Antitrust Division of the United States Department of Justice from 1989 to 1991. I also served on the Defense Science Board task force on antitrust aspects of defense industry consolidation. In addition, I have been a member of policy task forces under the aegis of the Governor of New Jersey and the National Research Council.

8. I am the author of *Welfare Analysis of Policies Affecting Prices and Products*; *Contestable Markets and the Theory of Industry Structure* (with W. Baumol and J. Panzar); and numerous articles, including "Merger Analysis, IO Theory, and Merger Guidelines." I am also a co-editor of *The Handbook of Industrial Organization*, and have served on the editorial boards of

the *American Economic Review* and the *Journal of Industrial Economics*. I am an elected Fellow of the Econometric Society.

9. I have been especially active in both theoretical and applied analysis of telecommunications issues. Since leaving Bell Laboratories, I have been a consultant to AT&T, Bell Atlantic, Telstra and New Zealand Telecom, and have testified before the U.S. Congress, the Federal Communications Commission, and the Public Utility Commissions of about a dozen states. I have been on governmental and privately supported missions involving telecommunications throughout South America, Canada, Europe and Asia. I have written and testified on such subjects within telecommunications as the scope of competition, end-user service pricing and costing, unbundled access arrangements and pricing, the design of regulation and methodologies for assessing what activities should be subject to regulation, directory services, bypass arrangements, and network externalities and universal service. On other issues, I have worked as a consultant with the Federal Trade Commission, the Organization for Economic Cooperation and Development, the Inter-American Development Bank, the World Bank and various private clients. A full list of my articles and other professional publications and activities is presented in my *curriculum vitae*, which is attached as Exhibit 2.

II. ASSIGNMENT AND CONCLUSIONS

10. We have been asked to examine the economic and factual soundness of certain comments submitted by GTE Service Corporation (GTE) in opposition to the proposed joint

venture (the Global Venture) of AT&T Corporation (AT&T) and British Telecommunications plc (BT), and the plans by this venture to develop an Internet Protocol (IP)-based network.

11. Specifically, GTE contends that if AT&T and BT are permitted to form the Global Venture and develop an Internet Protocol-based network, they will "attain a monopoly position," and each of their competitors will be "relegated to a fringe position." (Comments in Opposition of GTE, p. 4). The GTE argument rests (explicitly or implicitly) on the following assumptions:

- (A) AT&T and BT already have a "dominant position among MNC accounts."
- (B) Once AT&T and BT establish their IP-based network, they will be able to "migrate" their MNC customers and thus attain a dominant position among MNC accounts in the provision of IP-based telecommunications services.
- (C) AT&T and BT will design their IP platform in such a way that the software applications written for their IP network will not be compatible with other IP networks. This result will be achieved by adopting *proprietary* rather than *open* Applications Programming Interfaces (APIs) in the Global Venture's IP platform.
- (D) Independent software vendors (ISVs) who create applications for the Global Venture's IP platform will not write equivalent applications for competing IP platforms, nor will they develop "converters" from one platform to another.
- (E) Because the Global Venture will start with dominance as an IP network provider, ISVs will develop more and better software applications for the Global Venture's IP platform than will be available for competing platforms. This, in turn, will induce more customers to use the Global Venture's IP network, leading to a

"vicious circle whereby their [AT&T's and BT's] dominance becomes ever more complete and entrenched."

- (F) The Global Venture will thereby achieve and maintain a monopoly in IP-based telecommunications, not because of any technical superiority of its IP platform but because AT&T and BT will start with dominance among MNC customers and will design their IP network with proprietary interfaces.

12. We understand that there is no evidence to support GTE's allegation that the Global Venture's IP network will include proprietary APIs, and that GTE's allegation is refuted by the very documents on which GTE relies. These documents state that the Global Venture's IP platform will be built on "open and accepted standards for the needed components and applications,"¹ which will be "flexible enough to provide features and applications to customers, regardless of the carrier who ultimately delivers them."² If AT&T and BT do what they say, and deploy an IP network with open, compatible interfaces, then there could be no concerns of market dominance because of a "vicious circle" (to use GTE's phrase) or "monopoly tipping" (the term sometimes used by economists). As Katz and Shapiro pointed out: "With compatibility, there is one big network and tipping to a single variant is impossible."³

¹ AT&T/BT Joint Technical White Paper, <<http://att-bt-globalventure.com/technology/whitepaper.doc>>.

² Global Venture Network, Technology Backgrounder, <<http://att-bt-globalventure.com/technology/index.html>>.

³ Michael L. Katz and Carl Shapiro, *Antitrust in Software Markets*, Sept. 22, 1998, p. 4-5, available at <<http://www.haas.berkeley.edu/~shapiro/software.pdf>>.

13. Our task, however, was not to ascertain whether the actual intentions of AT&T and BT are consistent with their public statements. Rather, we address whether the formation of the Global Venture and its planned deployment of an IP-based network could raise significant competitive or public interest concerns, even if AT&T and BT were to have intentions that differed from their public statements.

14. We have not addressed the technical issues underlying GTE's argument. Even if the Global Venture did adopt proprietary, incompatible APIs, that fact would not necessarily limit the availability of software applications written for the Global Venture's IP network. It may be a relatively straightforward matter for a software developer to issue alternative versions of its applications for each IP platform. Also, it may be possible for a platform sponsor to include conversion programs. Such devices, if feasible, could ameliorate any incompatibility problems and thus prevent the "vicious circle" that GTE describes. The economic literature contains examples of "converters" used to establish compatibility with a leading firm's proprietary products.⁴ We do not have the technological expertise to comment on the feasibility of such arrangements here, but it is an issue that would have to be considered before giving credence to GTE's claim. In the remainder of this affidavit, we will assume that AT&T and BT *could* adopt

⁴ For example, Honeywell developed a program that allowed its mainframe computers to run programs written for IBM hardware. With regard to personal computers, some software developers used "cross-platform tools" to write applications for either the Windows or OS/2 operating systems. Michael L. Katz & Carl Shapiro, *Network Externalities, Competition and Compatibility*, 75 Amer. Econ. Rev. 424, 434 (June 1985); Joseph Farrell & Garth Saloner, *Converters, Compatibility and the Control of Interfaces*, 40 Jnl. Ind. Econ. 9 (March 1992); Stanley M. Besen and Joseph Farrell, *Choosing How to Compete: Strategies and Tactics in Standardization*, 8 Jnl. Econ. Persp. 117, 123 n.10 (Spring 1994).

proprietary APIs that software developers and competitors would be unable to design around -- even though this fact has not been established.

15. We have concluded that the assumptions underlying GTE's argument are unfounded, and that GTE has not raised any significant competitive or public interest concerns. Specifically, we have reached the following conclusions:

- (A) We have seen no evidence that the combination of AT&T's and BT's international businesses will create market power in any relevant market. In fact, considerable available evidence indicates that the Global Venture will be subject to strenuous competition from many other vendors who are more advanced in the development and provision of IP-based telecommunications services.
- (B) The absence of monopoly power precludes the Global Venture from successfully executing the putative strategy of adopting noncompatible interfaces to exclude rivals.
- (C) Regardless of whatever customer relationships that AT&T and BT possess today, there are powerful economic forces that will likely lead the Global Venture (as well as other carriers) to adopt open, compatible interfaces in their IP networks.
- (D) The standards for IP interfaces are likely to be public, open and defined by consensus among major industry participants and standard-setting organizations. If competition emerges between a public, open IP standard and a proprietary, noncompatible standard (of the kind GTE attributes to the Global Venture), the public, open standard is likely to prevail. Any incumbency advantage that the Global Venture might enjoy by virtue of AT&T's and BT's relationships with

numerous MNCs is unlikely to enable the venture to achieve dominance with noncompatible interfaces, even if it took the dubious business risk of such a strategy.

III. THE ECONOMIC FRAMEWORK FOR EVALUATING GTE'S OBJECTIONS

16. GTE's argument builds on the economic theory of "network effects." Network effects exist on the demand side when each person's benefit from using a product or technology increases with the number of people who also use that product or technology. Both telecommunications and the Internet are characterized by strong network effects. These technologies become more valuable as users are able to reach more people. For example, a fax machine is more useful as the number of people with compatible fax machines increases. Software platforms may also exhibit network effects. As the user base grows, more applications are written for the platform, making it more attractive to the next wave of users, while increasing the incentive of existing customers to stay with the platform.

17. When network effects are strong, a dominant *standard* is likely to emerge. It could be a proprietary one, but there are often strong incentives for market participants to push for an *open* standard. As explained more fully below, an open standard may be favored by users, by competing producers, and by suppliers of complementary goods and services. Standards are established in different ways:

- (A) Government agencies establish standards. For example, the worldwide standards that link telecommunications carriers and networks were established by a multinational organization, the International Telecommunications Union.
- (B) Private standard-setting organizations have established a number of recognized industry standards. In the United States, Committee T1, an organization accredited by the American National Standards Institute (ANSI), has set the standards governing interconnection and interoperability of telecommunications networks at interfaces with end user systems and carriers. With regard to the Internet, the continuing evolution of the major networking standards, including IP and TCP, as well as a number of service application standards, is overseen by the Internet Engineering Task Force (IETF), an arm of the Internet Society.
- (C) Standards are sometimes established by agreement among major industry participants, or by a single market leader. Other companies then follow the standard.
- (D) A dominant industry standard may emerge in the marketplace as the result of competition between different, incompatible technologies -- a competition that is often referred to as a "standards war."

18. When network effects are strong, a standards war will often result in a decisive winner because of a bandwagon phenomenon known as "tipping." If one product takes a clear lead, that fact makes the product more attractive to other customers (and to the businesses that support the product with complementary goods and services). For example, it is widely believed that network effects contributed to the enormous consumer acceptance achieved by the Microsoft

Windows operating system for personal computers. As the Windows user base grew, more applications were written for Windows, thus providing consumers with an even stronger reason to prefer that operating system.

19. The fact that tipping occurs, and that one product (or standard) becomes dominant, does not imply that the outcome resulted from any anticompetitive behavior or that the emergence of a single standard is contrary to the public interest. Even if it may be the case that occasionally the "wrong" technology wins, in the sense that the market settles on a standard that is inferior to possible alternatives,⁵ the underlying cause may have nothing whatsoever to do with any business misbehavior. Even Microsoft's critics agree that there is "nothing inherently anticompetitive" about market dominance resulting from network effects.⁶ In many markets there is "a natural tendency toward de facto standardization."⁷ We have written:

An emergence of a dominant standard is a natural feature of market dynamics where customers care about adhering to the standards for compatibility adopted by others, and where suppliers of important complementary products and services experience significant economies of scale, and consequently tend to support more vigorously those standards that are anticipated to be more popular. In such market scenarios, rivalry inevitably weakens some competitors because the smaller the chance that

⁵ Liebowitz and Margolis question whether there are *any* real-world examples of the market settling on the "wrong" standard. See Stan Liebowitz & Stephen E. Margolis, *Should Technology Choice Be a Concern of Antitrust Policy?*, 9 Harv. J. L. Tech. 283 (Summer 1996).

⁶ Declaration of Franklin M. Fisher, p. 6, *U.S. v. Microsoft Corp.*, No. 98-1232 (TPJ) (D.D.C.). Professor Fisher was testifying in support of the Government's monopolization case against Microsoft.

⁷ Michael L. Katz and Carl Shapiro, *Systems Competition and Network Effects*, 8 J. Econ. Persp. 93, 105-06 (Spring 1994). See also Mark A. Lemley and David McGowan, *Legal Implications of Network Economic Effects*, 86 Calif. L. Rev. 479, 497 (1998): "Tipping is neither inherently good nor bad. If the economics of a particular market dictate that having one standard is more efficient than competition among standards, then 'tipping' to one standard is in theory inevitable..."

their technologies will become (or persist as) a standard, the lesser the appeal of these technologies to end users and to the suppliers of complementary inputs.⁸

20. Economics teaches that the circumstances in which network effects pose antitrust and competitive concerns are sharply limited.⁹ The scenario that GTE has described is an example of what we have called "predatory systems rivalry."¹⁰ Competitive concerns are sometimes raised when an incumbent selling a "system" (that is, a package of products that work together) redesigns the system in a fashion that renders a rival's components incompatible. Such action may be pro-competitive and in the best interests of consumers (for example, if the new design is superior or if it stimulates further innovation), even though it puts rivals at a disadvantage. On the other hand, such behavior may be predatory. The challenge is to identify economic criteria that distinguish anticompetitive from pro-competitive product design decisions. As Katz and Shapiro have pointed out, "compatibility can either increase or decrease competition, depending on market conditions."¹¹

⁸ Janusz A. Ordover & Robert D. Willig, *Economist's View: The Department of Justice Guidelines for the Licensing and Acquisition of Intellectual Property*, 9 Antitrust 29, 34-35 (Spring 1995).

⁹ See, e.g., Janusz A. Ordover & Robert D. Willig, *An Economic Definition of Predation: Pricing and Product Innovation*, 91 Yale L.J. 8 (1981); Janusz A. Ordover, Alan O. Sykes & Robert D. Willig, *Predatory Systems Rivalry: A Reply*, 83 Colum. L. Rev. 1150 (1983). See also Ordover's testimony as an invited witness in the FTC's *Hearings on Global and Innovations Based Competition*, FTC Dkt. P951201 (1995).

¹⁰ Janusz A. Ordover & Robert D. Willig, *An Economic Definition of Predation: Pricing and Product Innovation*, 91 Yale L.J. 8 (1981).

¹¹ Katz and Shapiro, *supra* note 3, at 30.

21. Many years ago, we formulated a series of tests to identify when a systems design decision is anticompetitive. We explained that certain structural conditions must prevail if predatory behavior is to be a feasible and rational business strategy. In particular, systems rivalry cannot be anticompetitive unless the alleged "predator" firm has monopoly power at the outset over one component of a system that is purchased by customers.¹² It is only fair to note that some writers have criticized our tests because they believed we subjected system design decisions to *too much* antitrust scrutiny.¹³ Nevertheless, we believe there is general agreement among experts in the field that *in the absence of monopoly power, there should be no competitive concerns about a firm's decisions to design its systems to be incompatible with those of its rivals.*¹⁴

22. Economists have studied a number of standards wars and have tried to identify the forces that led some firms to adopt noncompatible, proprietary designs and the factors that influenced the outcome of such wars.¹⁵ Several conclusions are noteworthy:

¹² Janusz A. Ordover, Alan O. Sykes & Robert D. Willig, *Predatory Systems Rivalry: A Reply*, 83 Colum. L. Rev. 1150, 1152 (1983).

¹³ Frank Easterbrook called our test "a plaintiff's dreamland." *Comments on "An Economic Definition of Predatory Product Innovation"*, in *Strategy, Predation, and Antitrust Analysis*, at 441 (Steven C. Salop, ed., 1981). See generally William E. Cohen, *Competition and Foreclosure in the Context of Installed Base and Compatibility Effects*, 64 Antitrust L. J. 535, 557-560 (1996), for a summary of the literature surrounding our writings.

¹⁴ For example, in their recent paper on *Antitrust in Software Markets*, Katz and Shapiro discuss the policy implication of a firm's decision to have closed interfaces. Their conclusion is that in the absence of monopoly power, "any argument for mandatory open interfaces is weak at best." Katz & Shapiro, *supra* note 3, at 40.

¹⁵ See, e.g., Stanley M. Besen and Joseph Farrell, *Choosing How to Compete: Strategies and Tactics in Standardization*, 8 Jnl. Econ. Persp. 117 (Spring 1994).

(A) A standards war poses very high risks to a firm initiating it because of the winner-take-all tendency in markets prone to tipping; if the firm sponsors a standard that is not accepted in the marketplace, it may find itself excluded altogether. Therefore, if the battle can be avoided by the adoption of a common standard, a risk averse firm should not launch a war based on a proprietary technology unless it is highly confident of victory.¹⁶

(B) In a war between an open standard and a proprietary standard, reliance on the proprietary standard is especially risky. As Shapiro and Varian write:

[F]ailure to open a technology can spell its demise, if consumers fear lock-in or you face a strong rival whose system offers comparable performance but is nonproprietary. Sony faced precisely this problem with its Beta video cassette recorder system and lost out to the more open VHS system, which is now the standard. Openness will bolster your chances of success by attracting allies and assuring would-be customers that they will be able to turn to multiple suppliers down the road.¹⁷

(C) In the telecommunications and Internet arenas, there has been a pronounced market preference for open standards. Recent history is filled with examples of companies that advanced proprietary standards, only to be defeated by open standards.¹⁸ As Shapiro and Varian sum up:

Unless you are in a truly dominant position at the outset, trying to control the technology yourself can leave you a large share of a tiny pie.... The openness strategy is critical when no one firm is strong enough to dictate technology standards. Openness also arises

¹⁶ *Id.*; Michael L. Katz and Carl Shapiro, *Systems Competition and Network Effects*, 9 J. Econ. Persp. 93, 111 (Spring 1994).

¹⁷ Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* 197 (1998).

¹⁸ See Affidavit of Thomas B. London.

naturally when multiple products must work together, making coordination in product design essential.

In some industries with strong network characteristics, full openness is the only feasible approach. For years basic telecommunications standards have been hammered out by official standard setting bodies, either domestically or internationally.¹⁹

- (D) A firm must have various strategic "assets" in order to have a chance of prevailing in a standards war, particularly when competing against an open standard. Key assets are (1) a superior technology protected by intellectual property rights,²⁰ (2) a large installed base of customers who are "locked in" to the new technology,²¹ (3) a significant first-mover advantage,²² and (4) strength in the complementary products that customers will use.²³ Furthermore, to win a standards war, a firm needs to convince its potential customers that its standard is likely to prevail. That

¹⁹ Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* 199, 201 (1998).

²⁰ See Mark A. Lemley and David McGowan, *Legal Implications of Network Economic Effects*, 86 Calif. L. Rev. 479, 527 n.205 (1998) (pointing out that a company cannot expect to win a standards war "before developing an intellectual property right" in its proprietary technology).

²¹ Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* 270-71 (1998).

²² William E. Cohen, *Competition and Foreclosure in the Context of Installed Base and Compatibility Effects*, 64 Antitrust L. J. 535, 536-39 (1996); Michael L. Katz and Carl Shapiro, *Systems Competition and Network Effects*, 8 J. Econ. Persp. 93, 107 (Spring 1994); Stanley M. Besen and Joseph Farrell, *Choosing How to Compete: Strategies and Tactics in Standardization*, 8 Jnl. Econ. Persp. 117, 122 (Spring 1994).

²³ Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* 270-72 (1998).

is because *expectations* are critical in a market with strong network effects, where customers want to be on the winner's bandwagon.²⁴

IV. ANALYSIS

A. **The Global Venture Will Not Have the Monopoly Power Necessary to Harm Competition Through the Implementation of an IP Network**

23. The first issues in considering GTE's argument are whether the Global Venture does (or likely will) have monopoly power in the provision of any telecommunications services demanded by the MNCs, and whether it does (or likely will) have monopolistic control over any inputs critical to the IP network. If there is no such monopoly power, then adoption of proprietary standards or a launch of a "standards war" generally does not create competitive concerns, regardless of who wins. If there is no monopoly power, that should be the end of the analysis. Stated another way, if a firm adopts proprietary standards or triggers competition for the standard *and* ultimately prevails, there are likely strong efficiency (pro-consumer) reasons for its success. In particular, such success is most plausibly due to the desirability of its offerings, both as compared to rival proprietary standards, and as compared to alternative open standards.

²⁴ Jonathan Farrell & Garth Saloner, *Standards, compatibility and innovation*, 16 Rand Jnl. Econ. 70 (1985); Stanley M. Besen and Joseph Farrell, *Choosing How to Compete: Strategies and Tactics in Standardization*, 8 Jnl. Econ. Persp. 117 (Spring 1994); Michael L. Katz and Carl Shapiro, *Technology Adoption in the Presence of Network Externalities*, 94 Jnl. Pol. Econ. 822, 824 (1986).

24. We have seen no evidence indicating that a joint venture of AT&T and BT does (or likely will) have monopoly power in the provision of any telecommunications services demanded by MNCs. A useful way to gauge the extent of the Global Venture's alleged market power is to compare the market position that the Global Venture would have at its formation with AT&T's position in the domestic long distance market five or ten years ago. In a series of decisions going back to 1989, the Commission recognized that AT&T did not have market power in providing interstate service to business customers, even though AT&T had a market share of around 60%. The Commission reached this conclusion because AT&T had viable competitors, because those competitors had substantial excess capacity, and because "business customers are highly demand-elastic." They are "sophisticated and knowledgeable about the products they buy," and "routinely request proposals from carriers other than AT&T and accord full consideration to these proposals."²⁵

25. It is unreasonable to assume -- as GTE does -- that the Global Venture's market power vis-a-vis the MNCs will be stronger than AT&T's position in the provision of interstate services to business customers at the time that the Commission found AT&T to lack market power. Although precise market share figures are not available, it is clear that the Global Venture at its inception will have a share of the MNC global communications business that is far less than the roughly 60% AT&T share that the Commission was considering in the U.S. interstate domain. The Global Venture will face competition from several strong rivals in seeking the business of

²⁵ *Motion of AT&T to be Reclassified as a Non-Dominant Carrier*, 11 FCC Rcd. 3271, 3305-06 (1995); *First Interexchange Competition Order*, 6 FCC Rcd. 5880, 5887 (1991); *AT&T Price Cap Order*, 4 FCC Rcd. 3379 (1989).

MNC customers. Those customers are sophisticated and can well ascertain the business consequences of selecting any particular vendor. In addition, we have seen no evidence that the Global Venture will have market power with respect to any of the inputs required for competition in the global market, such as international transport capacity and operating agreements for foreign capacity.

26. Because the AT&T/BT venture does not have monopoly power, there is no need for any further analysis with regard to GTE's objection. A firm that does not possess monopoly power in some pertinent domains cannot successfully harm competition by adopting a noncompatible product design.

B. There Are Powerful Economic Forces Leading Carriers -- Including AT&T and BT -- to Adopt Open, Compatible Interfaces in Their IP Networks

27. Are there economic forces that create incentives for carriers to adopt open, compatible interfaces for their networks? If such incentives are present, it is likely that the Global Venture would act accordingly. Furthermore, the presence of such incentives make it likely that the *competitors* of the Global Venture would also adopt open, compatible interfaces.

28. Open, compatible standards have been the norm both in the evolution of telecommunications networks and in the emergence of the Internet. By their nature, telecommunications networks must have compatible interfaces because customers on one network need to interconnect with customers on other networks. That need surely will not diminish with

IP-based telecommunications services. The Internet itself has a history of open, compatible standards, which are constantly reviewed and updated by standard-setting bodies such as the IETF.²⁶ Compatibility has been the key to the Internet's growth. "The success of the Internet is due largely to its spectacular interoperability."²⁷ As Lemley observed, "it seems indisputable that the [Internet] market is driven towards standardization by a variety of forces."²⁸

29. One reason why a carrier developing an IP network is likely to select open, compatible standards is to maximize the number of innovative applications developed by independent software vendors (ISVs). As GTE recognizes, much of the value associated with an IP network will come from the customer's ability to integrate software applications. GTE professes to be afraid that the Global Venture will adopt proprietary interfaces, so that if an ISV writes an application for the Global Venture's IP platform, that application cannot be used on any other network. But if AT&T and BT choose this strategy, then ISVs would face higher costs (because of the need to accommodate the Global Venture's proprietary design) and they would be supplying a smaller market (because the software could not be used by customers on other networks). Such a strategy, therefore, would reduce the incentive that ISVs have to develop innovative applications for customers who use the Global Venture's IP network. In this type of

²⁶ One need only skim through the activities of the IETF's many working groups to appreciate the breadth and depth of its standard-setting activities. See <<http://www.ietf.org/proceedings/98dec>>.

²⁷ Mark A. Lemley and David McGowan, *Legal Implications of Network Economic Effects*, 86 Calif. L. Rev. 479, 552 (1998).

²⁸ Mark A. Lemley, *Antitrust and the Internet Standardization Problem*, 28 Conn. L. Rev. 1041, 1045 (1996).

situation -- when a firm must depend on the innovative activities of others -- there are strong incentives toward cooperative standard-setting, as noted above.

30. Compatibility will also be demanded by customers. They will insist that their legacy systems be compatible with the IP network. They will insist that any applications they purchase for use with the Global Venture network also function with the other networks they use. (It is our understanding that many MNCs use more than one carrier in the United States; and, of course, they typically rely on other carriers outside of the U.S. and the U.K.) They will want seamless communications with their dealers, customers, important suppliers and trading partners, and will expect the applications they buy to function on any "extranets" they establish with other companies (which may use other carriers). MNCs are sophisticated buyers. As pointed out above, they understand the advantages afforded by open standards and the risks of signing up for a proprietary alternative: the new technology might not be compatible with their existing systems, it may not be adequately supported down the road, and it could create room for opportunistic abuse if they are locked in. Indeed, the very fact that AT&T and BT have announced their intention to adopt open standards in their IP network is confirmation that this is what customers want. Furthermore, it is important to recognize that, unlike in markets with many "atomistic" buyers who cannot guide the evolution of the standards, MNCs have the incentive, knowledge and sophistication to guide or influence the evolution of the standards in a manner that reduces the chances of stranding and lock-in.

31. The argument presented by GTE assumes that once AT&T and BT establish their IP-based network, they will be able to "migrate" their MNC customers to this network. We

would not hold to any such assumption, even if the Global Venture adopted *open* standards. The IP network will in many ways be a new technology, and the Global Venture (like every other carrier) will have to earn the patronage of MNC customers.

32. In its objection, GTE alludes to Microsoft Windows and the "vicious circle" that allegedly allowed Microsoft to capture almost the entire PC operating system market. This example provides an instructive basis for comparison. All agree that Microsoft initially gained the leadership position because of IBM's support for Microsoft's MS-DOS operating system. Microsoft subsequently introduced a more ambitious operating system, Windows, with a graphic user interface. Significantly, Windows was introduced into a "standards vacuum." There was no set of industry standards or protocols to ensure compatibility among PC operating systems, nor was there any organization supported by major industry participants working to develop such standards. The only "standard" was Microsoft's own: it designed Windows to be backward compatible with its own product, MS-DOS. By contrast, provision of telecommunications and Internet services are blanketed with standards and protocols, which have been (and continue to be) developed by well-established organizations and supported by the major companies in the industry.

33. In sum, there are strong economic forces that would lead any carrier to adopt open interfaces. Thus, AT&T and BT must recognize that, regardless of what course they choose, their *competitors* can readily adopt open, mutually compatible interfaces that comply with industry standards. As discussed below, this would put the Global Venture at a competitive

disadvantage if (contrary to all public statements) it were to adopt proprietary, noncompatible APIs.

C. The Global Venture Cannot Ensure That Its Putative Proprietary Standard Would Prevail

34. The next issue presented by GTE's argument is whether AT&T and BT have the assets that would be necessary to make it likely that the Global Venture could win a standards war with proprietary interfaces. If the chances of victory are not high, then AT&T and BT have mutual incentives not to initiate a standards war by using proprietary APIs. Furthermore, if the potential customers of the Joint Venture do not *expect* the Global's Venture's standards to become dominant, they will be reluctant to get on that bandwagon and "lock" themselves into a technology that may not be adequately supported and employed by others in the future. This, in turn, would decisively undercut the Global Venture's chance of ever gaining dominance.

35. According to GTE, the Global Venture could count on winning such a war because of AT&T's and BT's "dominant position among MNC accounts." But, as pointed out earlier, their current position -- prior to the planned launching of the IP network in the year 2000 -- does not rise to the level of dominance. More importantly, there is no reason to believe that AT&T's and BT's existing MNC customer base would be "locked in" to the Global Venture's planned IP network. On the contrary, the fact that both AT&T and BT have so far been falling behind in the IP race belies any notion that the Global Venture will have a "lock" on the IP business of their existing MNC accounts.

36. As we explained earlier, it would be a high-risk strategy for the Global Venture (or any carrier) to adopt an incompatible design. History teaches that proprietary standards relating to the Internet have not fared well in competition with open standards. Unless they had a high expectation of winning, it would be foolish for AT&T and BT to start a standards war. And, as noted, unless MNCs *expected* the proprietary standard to become dominant, it would be unwise for them to jump on that bandwagon for fear of being "stranded." It is hard to see how they could form such an expectation, given that (1) AT&T and BT do not have a "first-mover advantage" in the IP arena, (2) they do not control any significant IP technologies, and (3) much of the value to customers of an IP-based network will come from software applications provided by third parties.

D. There Is No Reason for the Commission to Handicap the Evolution of IP-Based Telecommunications Networks

37. We have already explained why it is in the economic interest of AT&T and BT to adopt open, compatible interfaces in their IP network, and why they would not be expected to win a standards war if they were to adopt a proprietary, incompatible design. Suppose, however, that a carrier were to achieve a technological breakthrough that allowed it to provide a markedly superior IP platform. Under those circumstances, the carrier might decide to adopt a proprietary design that employed the breakthrough technology, and if customers thought it valuable enough, the design might conceivably prevail in the marketplace over an open design that did not include the new technology. There is nothing in this hypothetical scenario that is inherently anticompetitive or contrary to the public interest -- whether the innovators are AT&T and BT, or someone else.

38. In sum, the economic forces in the industry are consistent with AT&T's and BT's statements that they intend to adopt open, compatible interfaces. There is no reason to expect them to adopt a proprietary, noncompatible design, and no reason to expect them to win a standards war if they were to choose such a strategy. In any event, these companies do not have monopoly power, individually or collectively, and consequently the formation of the Global Venture does not pose competitive or public interest concerns regardless of the strategy they adopt in the IP marketplace.

DECLARATION

I, Janusz A. Ordover, declare under penalty of perjury that the foregoing is true and correct. Executed on February 16th 1999.

Janusz Ordover

DECLARATION

I, Robert D. Willig, declare under penalty of perjury that the foregoing is true and correct. Executed on February 16, 1999.

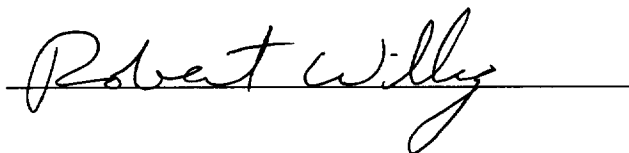
A handwritten signature in cursive script, reading "Robert D. Willig", is written over a horizontal line.

EXHIBIT 1

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EDUCATION

- 1968-1973 Columbia University, New York, New York
Graduate Department of Economics and European Institute of the School of International Affairs
Doctoral Dissertation: Three Essays on Economic Theory, May 1973
- 1967-1968 McGill University, Montreal, Canada
Departments of Economics and Political Science
- 1963-1966 Warsaw University, Warsaw, Poland
Department of Political Economy

HONORS

- 1973 Columbia University: Highest distinction for the doctoral dissertation
- 1971-1972 Columbia University: Honorary President's Fellow
- 1969-1971 Columbia University: President's Fellow
- 1967-1968 McGill University: Honors Student
- 1964, 1965 Warsaw University: Award for Academic Achievement, Department of Political Economy
- Who's Who in the World
Who's Who in America
Who's Who in the East

PROFESSIONAL EXPERIENCE

- June 1982 - Professor of Economics
present Department of Economics, New York University, New York, New York
- Sept. 1996 - Director of Masters in Economics Program
present Department of Economics, New York University
- Summer 1996- Lecturer
present International Program on Privatization and Reform
Institute for International Development, Harvard University, Cambridge, Massachusetts

Professional Experience (continued)

Aug. 1991 - Deputy Assistant Attorney General for Economics
Oct. 1992 Antitrust Division
United States Department of Justice, Washington, D.C.

Sept. 1989 - Visiting Professor of Economics
July 1990 School of Management and Organization, Yale University, New Haven, Connecticut

Lecturer in Law
Yale Law School

Mar. 1984 - Visiting Professor of Economics
June 1988 Universita Commerciale "Luigi Bocconi", Milan, Italy.

June 1982 - Director of Graduate Studies
Feb. 1985 Department of Economics, New York University

Sept. 1982 - Adjunct Professor of Law (part-time)
June 1986 Columbia University Law School, New York, New York

Feb. 1982 - Acting Director of Graduate Studies
June 1982 Department of Economics, New York University

June 1978 - Associate Professor of Economics
June 1982 Department of Economics, New York University

Sept. 1979 - Lecturer in Economics and Antitrust
May 1990 New York University Law School

Sept. 1977 - Member, Technical Staff
June 1978 Bell Laboratories, Holmdel, New Jersey

Associate Professor of Economics
Columbia University

Visiting Research Scholar
Center for Law and Economics, University of Miami, Miami, Florida

Sept. 1973 - Assistant Professor of Economics
Aug. 1977 New York University

Summer 1976 Fellow
Legal Institute for Economists, Center for Law and Economics, University of Miami

Summer 1976 Visiting Researcher
Bell Laboratories, Holmdel, New Jersey

OTHER PROFESSIONAL ACTIVITIES

1997 - present	Consultant Inter-American Development Bank, Washington, D.C.
1997 - present	Board of Editors Antitrust Report
1995 - present	Consultant The World Bank, Washington, D.C.
1995 - present	Senior Affiliate Cornerstone Research, Inc., Palo Alto, California
Fall 1995	Testimony, Hearings of the Federal Trade Commission "Anticipating the 21st Century: Competition Policy in the New High-Tech, Global Marketplace," Washington, D.C.
1994 - 1996	Senior Affiliate Law and Economics Consulting Group, Emoryville, California
1994 - present	Senior Affiliate Consultants in Industry Economics, LLC, Princeton, New Jersey
1993 - 1994	Director Consultants in Industry Economics, Inc., Princeton, New Jersey
1992 - 1993	Vice-Chair (<i>pro tempore</i>) Economics Committee, American Bar Association, Chicago, Illinois
1992 - 1995 1990 - 1991	Senior Consultant Organization for Economic Cooperation and Development, Paris, France
1991	Member <i>Ad hoc</i> Working Group on Bulgaria's Draft Antitrust Law The Central and East European Law Initiative American Bar Association
1990 - 1991	Advisor Polish Ministry of Finance and Anti-Monopoly Office Warsaw, Poland
1990 - 1991	Member Special Committee on Antitrust Section of Antitrust Law, American Bar Association
1990 - 1991	Director and Senior Advisor Putnam, Hayes & Bartlett, Inc., Washington, D.C.

Other Professional Activities (continued)

1990 - 1996 Member
 Predatory Pricing Monograph Task Force
 Section of Antitrust Law, American Bar Association

April 12, Witness
1989 Hearings on Competitive Issues in the Cable TV Industry
 Subcommittee on Monopolies and Business Rights of the Senate Judiciary Committee
 Washington, D.C.

1989 Member
 EEC Merger Control Task Force, American Bar Association

1988 - Associate Member
present American Bar Association

1987 - 1989 Adjunct Member
 Antitrust and Trade Regulation Committee, The Association of the Bar of the City of New York

1984 Speaker, "Industrial and Intellectual Property: The Antitrust Interface"
 National Institutes, American Bar Association, Philadelphia, Pennsylvania

1983 - 1990 Director
 Consultants in Industry Economics, Inc.

1982 Member
 Organizing Committee
 Tenth Annual Telecommunications Policy Research Conference, Annapolis, Maryland

1981 Member
 Section 7 Clayton Act Committee, Project on Revising Merger Guidelines
 American Bar Association

1980 Organizer
 Invited Session on Law and Economics
 American Economic Association Meetings, Denver, Colorado

1978 - 1979 Member
 Department of Commerce Technical Advisory Board
 Scientific and Technical Information Economics and Pricing Subgroup

1978 - present Referee for numerous scholarly journals, publishers, and the National Science Foundation

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

American Economic Association
American Bar Association

PUBLICATIONS

A. Journal Articles

"Parity Pricing and its Critics: Necessary Condition for Efficiency in Provision of Bottleneck Services to Competitors," with W. J. Baumol and R.D. Willig, *Yale Journal on Regulation*, vol. 14, Winter 1997, 146-63.

"Competition and Trade Law and the Case for a Modest Linkage," with E. Fox, *World Competition, Law and Economics Review*, vol. 19, December 1995, 5-34.

"On the Perils of Vertical Control by a Partial Owner of Downstream Enterprise," with W.J. Baumol, *Revue D'économie industrielle*, No. 69, 3^e trimestre 1994, 7-20.

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"The 1992 Agency Horizontal Merger Guidelines and the Department of Justice's Approach to Bank Merger Analysis," with M. Guerin-Calvert, *Antitrust Bulletin*, vol. 37, no. 3, 667-688. Reprinted in *Proceedings of the 1992 Conference on Bank Structure and Competition: Credit Markets in Transition*, Federal Reserve Bank of Chicago, 1992, 541-560.

"Entry Analysis Under the 1992 Horizontal Merger Guidelines," with Jonathan B. Baker, *Antitrust Law Journal*, vol. 61, no. 1, Summer 1992, 139-146.

"Economics and the 1992 Merger Guidelines: A Brief Survey," with Robert D. Willig, *Review of Industrial Organization*, vol. 8, 139-150, 1993. Reprinted in E. Fox and J. Halverson (eds.), *Collaborations Among Competitors: Antitrust Policy and Economics*, American Bar Association, 1992, 639-652.

"Equilibrium Vertical Foreclosure: A Reply," with G. Saloner and S.A. Salop, *American Economic Review*, vol. 82, no. 3, 1992, 698-703.

"A Patent System for Both Diffusion and Exclusion," *Journal of Economic Perspectives*, vol. 5, Winter 1991, 43-60.

"R&D Cooperation and Competition," with M. Katz, *Brookings Papers on Economic Activity: Microeconomics*, 1990, 137-203.

"Equilibrium Vertical Foreclosure," with G. Saloner and S. Salop, *American Economic Review*, vol. 80, March 1990, 127-142.

"Antitrust Policy for High-Technology Industries," with W.J. Baumol, *Oxford Review of Economic Policy*, vol. 4, Winter 1988, 13-34. Reprinted in E. Fox and J. Halverson (eds.), *Collaborations Among Competitors: Antitrust Policy and Economics*, American Bar Association, 1991, 949-984.

"Conflicts of Jurisdiction: Antitrust and Industrial Policy," *Law and Contemporary Problems*, vol. 50, Summer 1987, 165-178.

"Market Structure and Optimal Management Organization," with C. Bull, *Rand Journal of Economics*, vol. 18, no. 4, Winter 1987, 480-491.

A. Journal Articles (continued)

"A Sequential Concession Game with Asymmetric Information," with A. Rubinstein, *Quarterly Journal of Economics*, vol. 101, no.4, November 1986, 879-888.

"The G.M.-Toyota Joint Venture: An Economic Assessment," with C. Shapiro, *Wayne Law Journal*, vol. 31, no. 4, 1985, 1167-1194.

"Economic Foundations and Considerations in Protecting Industrial and Intellectual Property: An Introduction," *ABA Antitrust Law Journal*, vol. 53, no. 3, 1985. 503-518, Comments, 523-532.

"Antitrust for High-Technology Industries: Assessing Research Joint Ventures and Mergers," with R.D. Willig, *Journal of Law and Economics*, vol. 28, May 1985, 311-334.

"Use of Antitrust to Subvert Competition," with W.J. Baumol, *Journal of Law and Economics*, vol. 28, May 1985, 247-266. Reprinted in *Journal of Reprints for Antitrust Law and Economics*, vol. 16, no. 2.

"Advances in Supervision Technology and Economic Welfare: A General Equilibrium Analysis," with C. Shapiro, *Journal of Public Economics*, vol. 25/3, 1985, 371-390.

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"Herfindahl Concentration, Rivalry and Mergers," with A. Sykes and R.D. Willig, *Harvard Law Review*, vol. 95, June 1982, 1857-1875.

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"An Economic Definition of Predation: Pricing and Product Innovation," with R.D. Willig, *Yale Law Journal*, vol. 91, November 1981, 8-53.

"On the Consequences of Costly Litigation in the Model of Single Activity Accidents: Some New Results," *Journal of Legal Studies*, June 1981, 269-291.

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A. Journal Articles (continued)

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"Linear Taxation of Wealth and Wages for Intragenerational Lifetime Justice: Some Steady-State Cases," with E.S. Phelps, *American Economic Review*, September 1975, 660-673.

B. Books and Monographs

Proceedings of the Tenth Annual Telecommunications Policy Research Conference, editor with O. Gandy and P. Espinosa, ABLEX Publishers, 1983.

Obstacles to Trade and Competition, with L. Goldberg, OECD, Paris, 1993.

Predatory Pricing, with William Green, *et al.*, American Bar Association, Section of Antitrust Law, Monograph 22, 1996.

Welfare Economics: Readings, editor with W.J. Baumol, Edward Elgar Publishing Ltd. (forthcoming).

C. Book Chapters

"Sustainable Privatization of Latin American Infrastructure: The Role of Law and Regulatory Institutions," with Evamaria Uribe, Chap. in R. D. Willig (ed) (forthcoming, 1999).

"Access and Bundling in High-Technology Markets," with R. D. Willig in (forthcoming, 1999).

"The Harmonization of Competition and Trade Law," with E. Fox, Chap. 15 in L. Waverman, *et al.* (eds.), *Competition Policy in the Global Economy*, Routledge, 1997, 407-439.

"Transition to a Market Economy: Some Industrial Organization Issues," with M. Iwanek, Chap. 7 in H. Kierzkowski, *et al.* (eds.), *Stabilization and Structural Adjustment in Poland*, Routledge, 1993, 133-170.

"Competition Policies for Natural Monopolies in a Developing Market Economy," with Russell Pittman, *Butterworth's Trade and Finance in Central and Eastern Europe*, Butterworth Law Publishers Ltd., 1993, 78-88, Reprinted in *Journal for Shareholders* (published by the Russian Union of Shareholder), Moscow, January 1993, 33-36; *Versenylugyeleti Ertesito* (Bulletin of Competition Supervision), Budapest, vol. 3, no. 1-2, January 1993, 30-41; *Narodni Hospodarstvi* (National Economy), Prague; *ICE: Revista de Economia*, No. 736 (December 1994) (in Spanish), 69-90; *USA: Politics, Economics, Ideology*, forthcoming.

"Antitrust: Source of Dynamic and Static Inefficiencies?" with W.J. Baumol, in T. Jorde and D. Teece (eds.), *Antitrust, Innovation, and Competitiveness*, Oxford University Press, 1992, 82-97. Reprinted in "The Journal of Reprints for Antitrust Law and Economics," vol. 26, no. 1 (1996).

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"Predation, Monopolization, and Antitrust," with G. Saloner, in R. Schmalensee and R.D. Willig (eds.), *Handbook of Industrial Organization*, vol. 1, North Holland, 1989, 538-596.

"Supervision Technology, Firm Structure, and Employees' Welfare," in *Prices, Competition and Equilibrium*, M. Peston and R.E. Quandt (eds.), Philip Allan Publishers, Ltd., 1986, 142-163.

"Perspectives on Mergers and World Competition," with R.D. Willig, in *Antitrust and Regulation*, R. Grieson (ed.), Lexington Books, 1986, 201-218.

"Transnational Antitrust and Economics," in *Antitrust and Trade Policies in International Trade*, B. Hawk (ed.), Matthew Bender, 1985, 233-248.

"Pricing of Interexchange Access: Some Thoughts on the Third Report and Order in FCC Docket No. 78-72," in *Proceedings of the Eleventh Annual Telecommunications Policy Research Conference*, Vincent Mosco (ed.), ABLEX Publishers, 1984, 145-161.

"Non-Price Anticompetitive Behavior by Dominant Firms Toward the Producers of Complementary Products," with A.O. Sykes and R.D. Willig, in *Antitrust and Regulation: Essays in Memory of John McGowan*, F. Fisher (ed.), MIT Press, 1985, 315-330.

"Local Telephone Pricing in a Competitive Environment," with R.D. Willig, in *Regulating New Telecommunication Networks*, E. Noam (ed.), Harcourt Brace Jovanovich, 1983, 267-289.

"An Economic Definition of Predatory Product Innovation," with R.D. Willig, in *Strategy, Predation and Antitrust Analysis*, S. Salop (ed.), Federal Trade Commission, 1981, 301-396.

"Marginal Cost," in *Encyclopedia of Economics*, D. Greenwald (ed.), McGraw-Hill, 2nd ed. 1994, 627-630.

"Understanding Economic Justice: Some Recent Development in Pure and Applied Welfare Economics," in *Economic Perspectives*, M. Ballabon (ed.) Harwood Academic Publishers, vol. 1, 1979, 51-72.

"Problems of Political Equilibrium in the Soviet Proposals for a European Security Conference," in *Columbia Essays in International Affairs*, Andrew W. Cordier (ed.) Columbia University Press, New York, 1971, 1951-1974.

D. Other Publications

"Predatory Pricing," in Peter Newman (ed.), *The New Palgrave Dictionary of Economics and the Law*, MacMillan (forthcoming).

Book review of L. Philips, *Competition Policy: A Game Theoretic Perspective*, reviewed in *Journal of Economic Literature*, vol. 35, No.3, September 1997, 1408-9.

"The Role of Efficiencies in Merger Assessment: The 1997 Guidelines," *Antitrust Report*, September 1997, 10-17.

"Bingaman's Antitrust Era," *Regulation*, vol. 20, No. 2, Spring 1997, 21-26.

"Competition Policy for High-Technology Industries," *International Business Lawyer*, vol. 24, No. 10, November 1996, 479-82.

"Internationalizing Competition Law to Limit Parochial State and Private Action: Moving Towards the Vision of World Welfare," with E.M. Fox, *International Business Lawyer*, vol. 24, No. 10, November 1996, 458-62.

"Economists' View: The Department of Justice Draft for the Licensing and Acquisition of Intellectual Property," *Antitrust*, vol. 9, No. 2, Spring 1995, 29-36.

"Competition Policy During Transformation to a Centrally Planned Economy: A Comment," with R.W. Pittman, in B. Hawk (ed.), *1992 Fordham Corporate Law Institute*, 533-38.

"Poland: The First 1,000 Days and Beyond," *Economic Times*, vol. 3, no. 9, October 1992, 6-7.

"Interview: Janusz A. Ordoover: A Merger of Standards? The 1992 Merger Guidelines," *Antitrust*, vol. 6, no. 3, Summer 1992, 12-16.

"Interview: U.S. Justice Department's New Chief Economist: Janusz A. Ordoover," *International Merger Law*, no. 14, October 1991.

"Poland: Economy in Transition," *Business Economics*, vol. 26, no. 1, January 1991, 25-30.

"Economic Analysis of Section 337: Protectionism versus Protection of Intellectual Property," with R.D. Willig, in *Technology, Trade and World Competition*, JEIDA Conference Proceedings, Washington, D.C., 1990, 199-232.

"Eastern Europe Needs Antitrust Now," with E. Fox, *New York Law Journal*, November 23, 1990, 1-4.

"Understanding Econometric Methods of Market Definition," with D. Wall, *Antitrust*, vol. 3, no. 3, Summer 1989, 20-25.

"Proving Entry Barriers: A Practical Guide to Economics of Entry," with D. Wall, *Antitrust*, vol. 2, no. 2, Winter 1988, 12-17.

"Proving Predation After Monfort and Matsushita: What the New 'New Learning' has to Offer," with D. Wall, *Antitrust*, vol. 1, no. 3, Summer 1987, 5-11.

"The Costs of the Tort System," with A. Schotter, Economic Policy Paper No. PP-42, New York University, March 1986. Reprinted in *Congressional Record*, U.S. Government Printing Office, Washington, D.C., 1987.

"An Economic Definition of Predation: Pricing and Product Innovation," with R.D. Willig, Report for the Federal Trade Commission, October 1982, 131 pp.

"Market Power and Market Definition," with R.D. Willig, Memorandum for ABA Section 7 Clayton Act Committee, Project on Revising the Merger Guidelines, May 1981.

"Herfindahl Concentration Index," with R.D. Willig, Memorandum for ABA Section 7 Clayton Act Committee, Project on Revising the Merger Guidelines, March 1981.

"Public Interest Pricing of Scientific and Technical Information," Report for the Department of Commerce Technical Advisory Board, September 1979.

"Economics of Property Rights as Applied to Computer Software and Databases," with Y.M. Braunstein, D.M. Fischer, W.J. Baumol, prepared for the National Commission on New Technological Uses of Copyrighted Works, June 1977, 140 pp. Reprinted in part in *Technology and Copyright*, R.H. Dreyfuss (ed.), Lemond Publications, 1978.

Book review of O. Morgenstern and G.L. Thompson, *Economic Theory of Expanding and Contracting Economies*, reviewed in *Southern Economic Journal*, September 1978.

"Manual of Pricing and Cost Determination for Organizations Engaged in Dissemination of Knowledge," with W.J. Baumol, Y.M. Braunstein, D.M. Fischer, prepared for the Division of Science Information, NSF April 1977, 150 pp.

UNPUBLISHED PAPERS

"Economics, Antitrust and the Motion Picture Industry," C.V. Starr Center Policy Paper, July 1983.

"On Bargaining, Settling, and Litigating: A Problem in Multiperiod Games With Imperfect Information," with A. Rubinstein, C.V. Starr Working Paper, December 1982.

"Supervision and Social Welfare: An Expository Example," C.V. Starr Center Working Paper, January 1982.

"Should We Take Rights Seriously: Economic Analysis of the Family Education Rights Act," with M. Manove, November 1977.

"An Echo or a Choice: Product Variety Under Monopolistic Competition," with A. Weiss; presented at the Bell Laboratories Conference on Market Structures, February 1977.

GRANTS RECEIVED

Regulation and Policy Analysis Program, National Science Foundation, Collaborative Research on Antitrust Policy, Principal Investigator, July 15, 1985 - December 31, 1986.

Regulation of Economic Activity Program, National Science Foundation, Microeconomic Analysis of Antitrust Policy, Principal Investigator, April 1, 1983 - March 31, 1984.

Economics Division of the National Science Foundation, "Political Economy of Taxation," Principal Investigator, Summer 1982.

Sloan Workshop in Applied Microeconomics (coordinator), with W.J. Baumol (Principal Coordinator), September 1977 - August 1982.

Economics Division of the National Science Foundation, "Collaborative Research on the Theory of Optimal Taxation and Tax Reform," July 1979 to September 1980, with E.S. Phelps.

Division of Science Information of the National Science Foundation for Research on "Scale Economies and Public Goods Properties of Information," W.J. Baumol, Y.M. Braunstein, M.I. Nadiri, Fall 1974 to Fall 1977.

National Science Foundation Institutional Grant to New York University for Research on Taxation and Distribution of Income, Summer 1974.